MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

BDS4614 – MANAGEMENT DECISION SCIENCE

(All Sections/Groups)

11 FEBRUARY 2023
2.30 p.m. – 5.30 p.m.
(3 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** printed pages excluding the cover page, with **5** questions only.

2. Attempt **ALL FIVE (5)** the questions.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. Please write all your answers in the Answer Booklet provided. All necessary workings **MUST** be shown.

5. Normal distribution table is attached at the end of this question paper.

QUESTION 1 [Total = 20 marks]

Lexon Company produces high technology and innovative digital watches. In their new product launching of Special watches and Deluxe watches, they have to decide on the number of these two products to be produced. They indicate that at most 150 of the Special watch sets and 90 of the Deluxe watch sets can be sold per month. The maximum number of work hours available is 500 per month which a Special watch set requires 20 work hours and a Deluxe watch set needs 10 work hours. Each Special watch sold a profit of RM 5,000 and each Deluxe watch yields a profit of RM 4,400.

(a) Formulate the problem above as maximization Linear Programming Model.

[5 marks]

(b) Set up the initial simplex tableau by including the necessary slack variables.

[4 marks]

(c) The optimal tableau for the above problem is given below, where x_1 is Special watch, x_2 is Deluxe watch, S1 and S_2 are the slack variables for monthly sales of Special watch and Deluxe watch, respectively and S_3 is the slack variable relating to the work hours for both sets.

C_j →		5000	4000	0	0	0	
	Solution Mix	x_1	x_2	S_1	S_2	S_3	***Quantity***
0	S_1	1	0	1	0	0	150
0	S_2	-2	0	0	1	-0.1	40
4400	x_2	2	1	0	0	0.1	50
	Z_j	8800	4400	0	0	440	220,000
	$C_j - Z_j$	-3800	0	0	0	-440	

(i) State the optimal solution and the maximize profit. [3 marks]

(ii) Which of the constraint(s) are binding? Why? [2 marks]

(iii) If the premium required for an additional work hour for both sets is RM450 per hour, is it worth acquiring additional units of this resource? Explain your answer.

[2 marks]

(iv) If the right – hand side of constraint 3 were increased by 5 units, how much would the profit increase? [2 marks]

(v) What will happen to the profit if Lexon Company wants to produce Special watch for their next production cycle? [2 marks]

Continued...

QUESTION 2 [Total = 20 marks]

a) Phtyon Company produces 2,000 units of laser printers from each of its three factories situated in Ipoh, Johor Bahru and Kajang. The printers are supplied to three different locations M, N and P. The demand from M, N and P are 1,800, 1,700 and 2,700 units respectively. The transportation costs per unit from factories to the locations are given in the table below.

Transportation cost of Phyton Company

Factory	Location		
	M	N	P
Ipoh	9	7	14
Johor Bahru	7	12	11
Kajang	8	10	12

(i) Obtain an initial solution for the transportation problem using Northwest Corner method. [4 marks]

(ii) Using stepping stone method, determine the optimal solution and the minimum total cost. [8 marks]

b) Jenny Consultant Company has three accountants to be assigned to four different projects. Find the assignments of the accountants to projects that will minimize the total time (in days) to complete all the projects using Hungarian Method. The project completion time (in days) for each accountant is shown in the following table:

Accountant	Project			
	W	X	Y	Z
Aristo	11	11	9	7
Bob	7	9	8	12
Choo	13	14	10	9

What is the minimum total time (in days) to complete all the projects? [8 marks]

Continued...

QUESTION 3 [Total = 20 marks]

John has decided to open a fast-food restaurant in Cyberjaya. There are a lot of preparation work need to be done before the opening of the restaurant. He has compiled a list of activities and the time estimates for each activity. The list is as follows:

Activity	Immediate Activity	Time (weeks)		
		Optimistic	Most Likely	Pessimistic
A	-	3	4	5
B	-	4	5	6
C	-	7	8	15
D	B, C	9	10	11
E	A, C	8	11	14
F	E	6	8	16
G	D	4	7	10
H	C, F	4	7	10
I	A, F	10	11	12
J	G	4	6	8
K	H, I, J	7	8	9

a) Draw a network diagram to represent the problem. [4 marks]

b) Determine the expected time, variance, ES, EF, LS, LF and slack for each activity. [9 marks]

c) Determine the critical path and the expected completion time [2 marks]

d) Calculate the variance of the project. [2 marks]

e) What is the probability that John is able to open his restaurant within 45 weeks? [3 marks]

Continued...

QUESTION 4 [Total = 20 marks]

GoRun shop sells sports shoes. The annual demand for the sport shoes is 3,000 pairs. The shop's current policy is to order 300 pairs of shoes each time an order is placed. The shoes cost the company RM20 each. The annual holding cost for the inventory is 5% of the cost. The ordering cost is RM12. It takes 2 days for the order to arrive. The shop is open for business for 250 days a year.

a) What is the total annual inventory cost associated with the current policy? [4 marks]

b) If Economic Order Quantity model is used:

(i) What is the optimal order policy? [2 marks]

(ii) What is the total minimum annual inventory cost? [4 marks]

(iii) What is the cycle time? [2 marks]

c) What is the reorder point? [2 marks]

d) If the supplier reduces a pair of sport shoes cost to RM19.50 if the shop order 500 pairs or more, determine whether GoRun shop should take the offer. If so, what is the optimal order quantity and minimum total inventory cost? [6 marks]

Continued...

QUESTION 5 [Total = 20 marks]

Jane is going to introduce one of the three new products: A, B and C or do nothing. As the market conditions (favourable, stable or unfavourable) affect the payoffs of the product, she estimates the following payoffs:

Product	Market condition, Payoff (RM)		
	Favourable	Stable	Unfavourable
A	8000	6000	-5000
B	5000	3000	-1200
C	7000	6000	-1000
Do nothing	0	0	0

a) Determine the best investment using the following decision criteria:

(i) Maximax [2 marks]

(ii) Maximin [2 marks]

(iii) Equally likely criterion [3 marks]

(iv) Criterion of realism, using $\alpha = 0.8$ [3 marks]

(v) Minimax regret criterion [4 marks]

b) For the data in part a), the probabilities of favourable market, stable market and unfavourable market are 0.4, 0.3 and 0.3 respectively.

(i) Construct an expected opportunity loss (EOL) table. [4 marks]

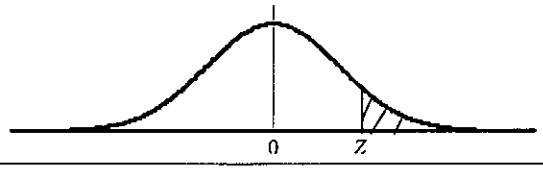
(ii) Using minimum EOL as the decision criterion, determine the best decision. [1 mark]

(iii) What is the expected value of perfect information? [1 mark]

End of question.

APPENDIX:

Table 1
The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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